ABB Robotics

Product manual
FlexLifter

Power and productivity
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Product manual

FlexLifter

IRL 600

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0.0.1 Overview

About this manual

This manual contains instructions for:

- the characteristics of the FlexLifter
- mechanical and electrical installation instructions for the FlexLifter
- maintenance instructions for the FlexLifter
- spare parts

Usage

This manual should be used when working during:

- installation, from lifting the robot to its work site and securing it to the foundation, to making it ready for operation
- maintenance work
- repair work.

Who should read this manual?

This manual is intended for:

- installation personnel
- maintenance personnel
- repair personnel.

Prerequisites

A maintenance /repair/ installation craftsman working with an ABB Robot must:

- be trained by ABB and have the required knowledge of mechanical and electrical installation/repair/maintenance work.

Organization of chapters

The manual is organized in the following chapters:

Chapter	Content
Safety	Safety information that must be read through before performing any installation or service work on the FlexLifter. Contains general safety aspects as well as more specific information about how to avoid personal injuries and damage to the product.
Description and technical details	Specifications and characteristics of the FlexLifter 600.
Unpacking, acceptance and handling	Information relative to the steps following the reception of the FlexLifter, until its installation.
Maintenance	Step-by-step procedures that describe how to perform maintenance of the FlexLifter 600. Based on a maintenance schedule that may be used in the work of planning periodical maintenance.
Spare parts	List of the spare parts available for the FlexLifter 600.

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References

Reference	Document ID
Product specification IRL 600	3HAW050008891
Product specification - IRT 501 - 66/66R/90/90R	3HAW050008591
Product Manual for IRT 501 - 66/66R/90/90R	3HAW050008590
Product manual - IRC5 Robot Controller	3HAC021313-001
Operating manual - IRC5 with FlexPendant	3HAC16590-1
Operating manual - Calibration Pendulum	3HAC16578-1
Service Information System - IRC5	3HAC025709-001
Application manual - Additional axes and stand alone controller	3HAC021395-001
System Parameters	3HAC17076-1

Revisions

Revision	Description
-	First edition

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0.0.2 Product documentation, M2004

Categories for manipulator documentation

The manipulator documentation is divided into a number of categories. This listing is based on the type of information in the documents, regardless of whether the products are standard or optional.

All documents listed can be ordered from ABB on a DVD. The documents listed are valid for M2004 manipulator systems.

Product manuals

All hardware, manipulators and controllers will be delivered with a **Product manual** that contains:

- Safety information.
- Installation and commissioning (descriptions of mechanical installation, electrical connections).
- Maintenance (descriptions of all required preventive maintenance procedures including intervals).
- Repair (descriptions of all recommended repair procedures including spare parts).
- Additional procedures, if any (calibration, decommissioning).
- Reference information (article numbers for documentation referred to in Product manual, procedures, lists of tools, safety standards).
- Parts list.
- Foldouts or exploded views.
- Circuit diagrams (or references to circuit diagrams).

Technical reference manuals

The technical reference manuals describe the manipulator software in general and contain relevant reference information.

- **RAPID Overview**: An overview of the RAPID programming language.
- **RAPID Instructions, Functions and Data types**: Description and syntax for all RAPID instructions, functions, and data types.
- **RAPID Kernel**: A formal description of the RAPID programming language.
- **System parameters**: Description of system parameters and configuration workflows.

Application manuals

Specific applications (for example software or hardware options) are described in **Application manuals**. An application manual can describe one or several applications.

An application manual generally contains information about:

- The purpose of the application (what it does and when it is useful).
- What is included (for example cables, I/O boards, RAPID instructions, system parameters, CD with PC software).
- How to use the application.
- Examples of how to use the application.

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Continued

Operating manuals

The operating manuals describe hands-on handling of the products. The manuals are aimed at those having first-hand operational contact with the product, that is production cell operators, programmers, and trouble shooters.

The group of manuals includes:

- **Emergency safety information**
- **General safety information**
- **Getting started, IRC5 and RobotStudio**
- **IRC5 with FlexPendant**
- **RobotStudio**
- **Introduction to RAPID**
- **Trouble shooting**, for the controller and manipulator.

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0.0.3 How to read the product manual

Reading the procedures

The procedures contain references to figures, tools, material etc. The references are read as described below.

References to figures

The procedures often include references to components or attachment points located on the robot/controller. The components or attachment points are marked with *italic text* in the procedures and completed with a reference to the figure where the current component or attachment point is shown.

The denomination in the procedure for the component or attachment point corresponds to the denomination in the referenced figure.

The table below shows an example of a reference to a figure from a step in a procedure.

	Action	Note/Illustration
8.	Remove the rear attachment screws, gearbox.	Shown in the figure *Location of gearbox on page xx*.

Reference to required equipment

The procedures often include references to equipment (spare parts, tools etc.) required for the different actions in the procedure. The equipment is marked with italic text in the procedures and completed with a reference to the section where the equipment is listed with further information, i.e. article number, dimension.

The denomination in the procedure for the component or attachment point corresponds to the denomination in the referenced list.

The table below shows an example of a reference to a list of required equipment, from a step in a procedure.

	Action	Note/Illustration
3.	Fit a new sealing, axis 2 to the gearbox.	Art. no. is specified in *Required equipment on page xx*.

Safety information

The manual includes a separate safety chapter that must be read through before proceeding with any service or installation procedures. All procedures also include specific safety information when dangerous steps are to be performed.

Read more in *Safety on page 13*.

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1 Safety

1.1. Introduction

Overview

The safety information in this manual is divided in two categories:

- general safety aspects, important to attend to before performing any service work on the robot. These are applicable for all service work and are found in *General safety information on page 14*.
- specific safety information, pointed out in the procedure at the moment of the danger. How to avoid and eliminate the danger is either detailed directly in the procedure, or further detailed in separate instructions, found in *Safety related instructions on page 31*.

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1.2 General safety information

1.2.1. Safety in the robot system

Validity and responsibility

The information does not cover how to design, install and operate a complete system, nor does it cover all peripheral equipment, which can influence the safety of the total system. To protect personnel, the complete system must be designed and installed in accordance with the safety requirements set forth in the standards and regulations of the country where the robot is installed.

The users of ABB industrial robots are responsible for ensuring that the applicable safety laws and regulations in the country concerned are observed and that the safety devices necessary to protect people working with the robot system are designed and installed correctly. Personnel working with robots must be familiar with the operation and handling of the industrial robot, described in the applicable documents, e.g. User's Guide and Product Manual.

Connection of external safety devices

Apart from the built-in safety functions, the robot is also supplied with an interface for the connection of external safety devices. Via this interface, an external safety function can interact with other machines and peripheral equipment. This means that control signals can act on safety signals received from the peripheral equipment as well as from the robot.

Limitation of liability

Any information given in this manual regarding safety, must not be construed as a warranty by ABB that the industrial robot will not cause injury or damage even if all safety instructions are complied with.

Related information

Type of information	Detailed in document	Section
Installation of safety devices	Product manual for the robot	Installation and commissioning
Changing robot modes	Operators manual (RobotWare 5.0)	Operating modes
Restricting the working space	Product manual for the robot	Installation and commissioning

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1.3 Safety risks

1.3.1. Safety risks during installation and service work on robot

Overview

This section includes information of general safety risks to be considered when performing installation and service work on the robot.

General risks during installation and service

- The instructions in the Product Manual - Installation and Commissioning must always be followed.
- Emergency stop buttons must be positioned in easily accessible places so that the robot can be stopped quickly.
- Those in charge of operations must make sure that safety instructions are available for the installation in question.
- Those who install the robot must have the appropriate training for the robot system in question and in any safety matters associated with it.

Nation/region specific regulations

To prevent injuries and damage during the installation of the robot system, the regulations applicable in the country concerned and the instructions of ABB Robotics must be complied with.

Non-voltage related risks

- Safety zones, which have to be crossed before admittance, must be set up in front of the robot's working space. Light beams or sensitive mats are suitable devices.
- Turntables or the like should be used to keep the operator out of the robot's working space.
- The axes are affected by the force of gravity when the brakes are released. In addition to the risk of being hit by moving robot parts, you run the risk of being crushed by the parallel arm.
- Energy, stored in the robot for the purpose of counterbalancing certain axes, may be released if the robot, or parts thereof, are dismantled.
- When dismantling/assembling mechanical units, watch out for falling objects.
- Be aware of stored heat energy in the controller.
- Never use the robot as a ladder, i.e. do not climb on the robot motors or other part during service work. There is a serious risk of slipping because of the high temperature of the motors or oil spills that can occur on the robot.

To be observed by the supplier of the complete system

- The supplier of the complete system must ensure that all circuits used in the safety function are interlocked in accordance with the applicable standards for that function.
- The supplier of the complete system must ensure that all circuits used in the emergency stop function are interlocked in a safe manner, in accordance with the applicable standards for the emergency stop function.

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1.3.1. Safety risks during installation and service work on robot

Continued

Complete robot

Safety risk	Description
Hot components! Removed parts may result in collapse of robot!	 Caution signal **Caution!** Motors and gears are HOT after running the robot! Touching the motors and gears may result in burns! Warning signal **Warning!** Take any necessary measures to ensure that the robot does not collapse as parts are removed, e.g. secure the lower arm with fixtures if removing motor, axis 2.

Cabling

Safety risk	Description
Cable packs are sensitive to mechanical damage!	 Caution signal **Caution!** The cable packs are sensitive to mechanical damage! They must be handled with care, especially the connectors, in order to avoid damaging them!

Gearboxes and motors

Safety risk	Description
Gears may be damaged if excessive force is used!	 Caution signal **Caution!** Whenever parting/mating motor and gearbox, the gears may be damaged if excessive force is used!

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1.3.2. Safety risks related to tools/workpieces

Safe handling

It must be possible to safely turn off tools, such as milling cutters, etc. Make sure that guards remain closed until the cutters stop rotating.

It should be possible to release parts by manual operation (valves).

Safe design

Grippers/end effectors must be designed so that they retain workpieces in the event of a power failure or a disturbance of the controller.

CAUTION!

Ensure that a gripper is prevented from dropping a workpiece, if such is used.

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1.3.3. Safety risks related to pneumatic/hydraulic systems

General

Special safety regulations apply to pneumatic and hydraulic systems.

Residual energy

- Residual energy may be present in these systems. After shutdown, particular care must be taken.
- The pressure in pneumatic and hydraulic systems must be released before starting to repair them.

Safe design

- Gravity may cause any parts or objects held by these systems to drop.
- Dump valves should be used in case of emergency.
- Shot bolts should be used to prevent tools, etc., from falling due to gravity.

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1.3.4. Safety risks during operational disturbances

General

- The industrial robot is a flexible tool which can be used in many different industrial applications.
- All work must be carried out professionally and in accordance with the applicable safety regulations.
- Care must be taken at all times.

Qualified personnel

- Corrective maintenance must only be carried out by qualified personnel who are familiar with the entire installation as well as the special risks associated with its different parts.

Extraordinary risks

If the working process is interrupted, extra care must be taken due to risks other than those associated with regular operation. Such an interruption may have to be rectified manually.

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1.3.5. Risks associated with live electric parts

Voltage related risks, general

- Although troubleshooting may, on occasion, have to be carried out while the power supply is turned on, the robot must be turned off (by setting the mains switch to OFF) when repairing faults, disconnecting electric leads and disconnecting or connecting units.
- The mains supply to the robot must be connected in such a way that it can be turned off outside the robot's working space.

Voltage related risks, controller IRC5

A danger of high voltage is associated with the following parts:

- Be aware of stored electrical energy (DC link, Ultra Cap unit) in the controller.
- Units inside the controller, e.g. I/O modules, can be supplied with power from an external source.
- The mains supply/mains switch
- The transformers
- The power unit
- The control power supply (230 VAC)
- The rectifier unit (400-480 VAC and 700 VDC. Note: Capacitors!)
- The drive unit (700 VDC)
- The drive system power supply (230 VAC)
- The service outlets (115/230 VAC)
- The customer power supply (230 VAC)
- The power supply unit for tools, or special power supply units for the machining process.
- The external voltage connected to the control cabinet remains live even when the robot is disconnected from the mains.
- Additional connections.

Voltage related risks, robot

A danger of high voltage is associated with the robot in:

- The power supply for the motors (up to 800 VDC).
- The user connections for tools or other parts of the installation (max. 230 VAC, see chapter Installation and commissioning in the Product manual).

Voltage related risks, tools, material handling devices, etc.

Tools, material handling devices, etc., may be live even if the robot system is in the OFF position. Power supply cables which are in motion during the working process may be damaged.

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1.4 Safety actions

1.4.1. Safety fence dimensions

General

Install a safety cell around the robot to ensure safe robot installation and operation.

Dimensioning

Dimension the fence or enclosure to enable it to withstand the force created if the load being handled by the robot is dropped or released at maximum speed. Determine the maximum speed from the maximum velocities of the robot axes and from the position at which the robot is working in the work cell (see *Product Specification - Description, Robot Motion*).

Also consider the maximum possible impact caused by a breaking or malfunctioning rotating tool or other device fitted to the manipulator.

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1.4.2. Fire extinguishing

NOTE!

Use a CARBON DIOXIDE (CO2) extinguisher in the event of a fire in the robot (manipulator or controller)!

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1.4.3. Emergency release of the robots/manipulators axes

Description

In an emergency situation, any of the robot's/manipulators axes may be released manually by pushing the brake release buttons on the robot.

How to release the brakes is detailed in section:

- *Motor brake release on page 58*. The robot arm may be moved manually on smaller robot models, but larger models may require using an overhead crane or similar.

Increased injury

Before releasing the brakes, make sure that the weight of the arms does not increase the pressure on the trapped person, further increasing any injury!

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1.4.4. Brake testing

When to test

During operation the holding brakes of each axis motor wear normally. A test may be performed to determine whether the brake can still perform its function.

How to test

The function of each axis' motor holding brakes may be checked as detailed below:

1. Run each manipulator axis to a position where the combined weight of the manipulator arm and any load is maximized (max. static load).
2. Switch the motor to the MOTORS OFF position with the Operating mode selector on the controller.
3. Check that the axis maintains its position.

If the manipulator does not change position as the motors are switched off, then the brake function is adequate.

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1.4.5. Risk of disabling function "Reduced speed 250 mm/s"

NOTE!

Do not change *Transm. gear ratio* or other kinematic parameters from the Teach Pendant Unit or a PC. This will affect the safety function Reduced speed 250 mm/s.

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1.4.6. Safe use of the Teach Pendant Unit

NOTE!

The enabling device is a push button located on the side of the Teach Pendant Unit (TPU) which, when pressed halfway in, takes the system to MOTORS ON. When the enabling device is released or pushed all the way in, the robot is taken to the MOTORS OFF state. To ensure safe use of the Teach Pendant Unit, the following must be implemented:

- The enabling device must never be rendered inoperative in any way.
- During programming and testing, the enabling device must be released as soon as there is no need for the robot to move.
- The programmer must always bring the Teach Pendant Unit with him/her, when entering the robot's working space. This is to prevent anyone else taking control of the robot without the programmer knowing.

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1.4.7. Work inside the manipulator's working range

WARNING!

If work must be carried out within the robot's work envelope, the following points must be observed:

- The operating mode selector on the controller must be in the manual mode position to render the enabling device operative and to block operation from a computer link or remote control panel.
- The robot's speed is limited to max. 250 mm/s when the operating mode selector is in position < 250 mm/s. This should be the normal position when entering the working space. The position 100% "full speed" may only be used by trained personnel who are aware of the risks that this entails.
- Pay attention to the rotating axes of the manipulator! Keep a distance to the axes in order not to get entangled with hair or clothing. Also be aware of any danger that may be caused by rotating tools or other devices mounted on the manipulator or inside the cell.

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1.4.8. Translate the information on safety and information labels

Labels on the product

Both the manipulator and the controller are marked with several safety and information labels, containing important information about the product. The information is useful for all personnel handling the robot system, e.g. during installation, service or operation.

Translation possibilities

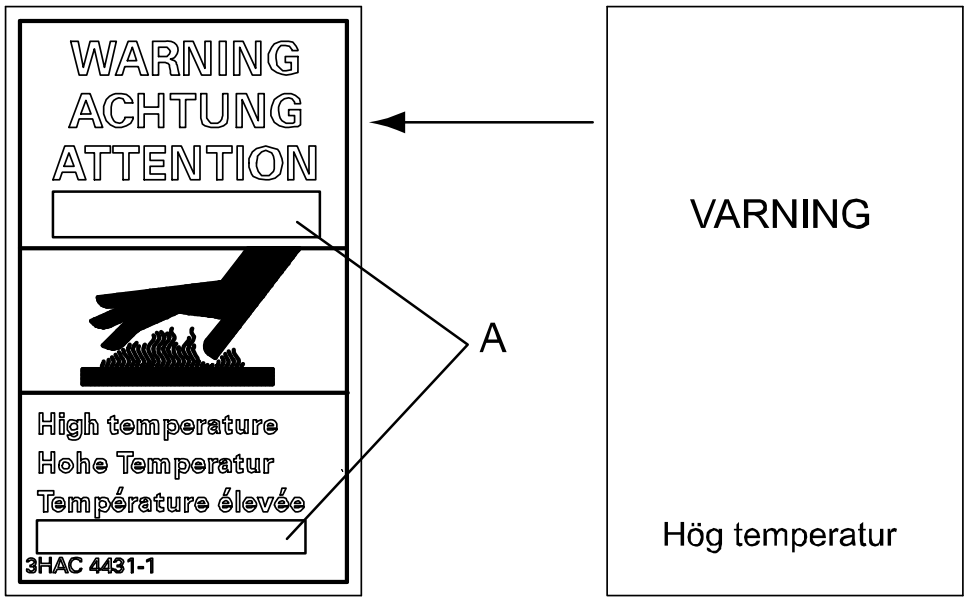
The labels fitted to the product contain space for adding a fourth language underneath the three standard languages (English, German and French).

Add a local language to the label by:

- using a transparent sticker over the standard label with text added in a fourth language. Drawings detailing the design (text, figure, dimensions) of the standard labels can be ordered from ABB. Notice that each label is identified according to the article number located in the lower corner of the label.

Example of transparent sticker

The figure below shows the location of the free space on one of the labels on the robot, where the fourth language can be added. The figure also shows a transparent sticker, containing the text in Swedish.



xx0500002517

A	Free space for adding a fourth language

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1.5 Safety stops

1.5.1. What is an emergency stop?

Definition of emergency stop

An emergency stop is a state that overrides any other manipulator control, disconnects drive power from the manipulator motors, stops all moving parts, and disconnects power from any potentially dangerous functions controlled by the manipulator system.

An emergency stop state means that all power is disconnected from the manipulator except for the manual brake release circuits. You must perform a recovery procedure, i.e, resetting the emergency stop button and pressing the Motors On button, in order to return to normal operation.

The manipulator system can be configured so that the emergency stop results in either:

- An uncontrolled stop, immediately stopping the manipulator actions by disconnecting power from the motors.
- A controlled stop, stopping the manipulator actions with power available to the motors so that the manipulator path can be maintained. When completed, power is disconnected.

The default setting is uncontrolled stop. However, controlled stops are preferred since they minimize extra, unnecessary wear on the manipulator and the actions needed to return the manipulator system back to production. Please consult your plant or cell documentation to see how your manipulator system is configured.

NOTE!

The emergency stop function may only be used for the purpose and under the conditions for which it is intended.

NOTE!

The emergency stop function is intended for immediately stopping equipment in the event of an emergency.

NOTE!

Emergency stop should not be used for normal program stops as this causes extra, unnecessary wear on the manipulator.

Classification of stops

The safety standards that regulates automation and manipulator equipment defines categories in which each type of stop applies:

If the stop is... ...	then it is classified as...
uncontrolled	category 0 (zero)
controlled	category 1

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1.5.1. What is an emergency stop?

Continued

Emergency stop devices

In a manipulator system there are several emergency stop devices that can be operated in order to achieve an emergency stop. There are emergency stop buttons available on the Flex-Pendant and on the controller cabinet (on the Control Module on a Dual Cabinet Controller).There can also be other types of emergency stops on your manipulator, consult your plant or cell documentation to see how your manipulator system is configured.

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1.6 Safety related instructions

1.6.1. Safety signals in the manual

Introduction to safety signals

This section specifies all dangers that may arise from performing the work detailed in the manual. Each danger is detailed in its own section consisting of:

- A caption specifying the danger level (DANGER, WARNING or CAUTION) and the type of danger.
- A brief description of what will happen if the operator/service personnel do not eliminate the danger.
- An instruction of how to eliminate the danger to facilitate performing the activity at hand.

Danger levels

The table below defines the captions specifying the danger levels used throughout this manual.

Symbol	Designation	Signification
danger	DANGER	Warns that an accident will occur if the instructions are not followed, resulting in a serious or fatal injury and/or severe damage to the product. It applies to warnings that apply to danger with, for example, contact with high voltage electrical units, explosion or fire risk, risk of poisonous gases, risk of crushing, impact, fall from height etc.
warning	WARNING	Warns that an accident may occur if the instructions are not followed, that can lead to serious injury, possibly fatal, and/or great damage to the product. It applies to warnings that apply to danger with, for example, contact with high voltage electrical units, explosion or fire risk, risk of poisonous gases, risk of crushing, impact, fall from height etc.
Electrical shock	ELECTRICAL SHOCK	The electrocution or electrical shock symbol indicates electrical hazards which could result in severe personal injury or death.
caution	CAUTION	Warns that an accident may occur if the instructions are not followed, that can result in injury and/or damage to the product. It also applies to warnings of risks that include burns, eye injury, skin injury, hearing damage, crushing or slipping, tripping, impact, fall from height etc. Furthermore, it applies to warnings that include function requirements when fitting and removing equipment, where there is a risk of damaging the product or causing a breakdown.

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1.6.1. Safety signals in the manual

Continued

Symbol	Designation	Signification
Electrostatic discharge (ESD)	ELECTROSTATIC DISCHARGE (ESD)	The electrostatic discharge (ESD) symbol indicates electrostatic hazards which could result in severe damage to the product.
Note	NOTE	Note symbols alert you to important facts and conditions.
Tip	TIP	Tip symbols direct you to specific instructions, where to find additional information or how to perform a certain operation in an easier way.

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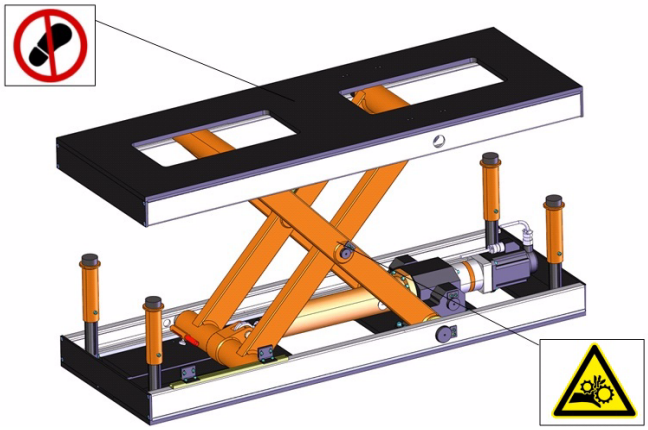
1.6.2. Location of the pictograms

Location of pictograms on the FlexLifter



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Symbol	Description	Position
Risk of severe injury to hands	Risk of severe injury to hands This pictogram must be positioned close to the scissor frame, risk of severe injury when lifter is going down.	
Do not walk	Do not walk The pictogram is located on the top plate. The top plate is not designed to be walkable.	

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1.7 Safety rules for unpacking and handling

1.7.1. Handling instructions

Only the pre-assembled FlexLifter is prepared for handling (see *Handling on page 53*).

TIP!

Read carefully the following instruction before unpacking the product.

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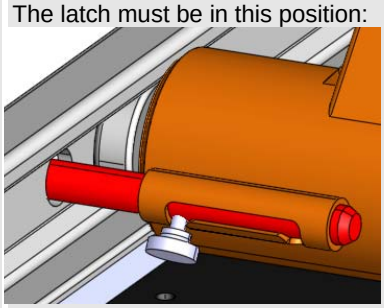
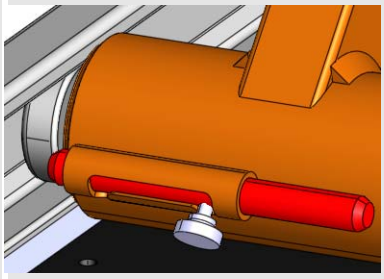
1.8 Safety instructions during mechanical assembly

1.8.1. Safety pin

The Flexlifter is equipped with an integrated safety pin, in order to secure the lifter position during maintenance operations. When the lifter is in the upper position, simply engage the pin in the hole and make sure that the latch is engaged.

	Action	Info/Illustration
1.	Engage the latch.	The latch must be in this position:  The following position is forbidden:
2.	After maintenance, pull the pin back in parking position.	

WARNING!

Make sure to pull back the pin in parking position after maintenance.

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1.8.2. Safety for electrical operations

Tooling cabling

Check that the tooling cables are secured in the dedicated cable trays, and that they are not in touch with moving part to avoid wear of the cable. The cabling of the tooling is the responsibility of the customer.

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1.8.3. Safety during setup & commissioning

Checking the working envelope

Before moving the lifter, it is important to check that nothing can interfere with the elevation. This includes the inside of the lower frame, in the moving arm area.

Ensure that no person is standing on the top plate before moving the lifter.

Check also that nothing is left on the top of the lifter (i.e. tools).

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2 Description

2.1. Overview

The FlexLifter IRL600 is designed to increase the robot working envelope by adding a programmable degree of freedom to the FlexTrack IRT501-66 or 66R. It is possible to use the unit to position a part tooling in front of the process robots (material handling applications). The unit can be used also as a stand-alone module.

High performance

The FlexLifter IRL600 integrates a powerful and compact servomotor equipped with a high quality gear, allowing high accelerations & speeds.

Ease of use

The upper plate of the lifter is adapted to material handling applications. The lower plate of the lifter is designed to adapt directly on FlexTrack IRT501-66 or 66R carriage.

The FlexLifter movements are programmed like a conventional axis using the robot controller interface.

Technical specifications

FlexLifter	Max payload	Average speed mm/s	Vertical stroke mm
IRL 600	600 kg	200	600

Modularity

The FlexLifter is module of the FlexLean product range.

It can be used an additional axes of the robot and work in coordinated motion with an ABB robot, or in conjunction with the ABB FlexTrack allowing the system to pickup and drop off a load.

The FlexLifter can also be used as a stand alone unit allowing programmable lifting of a high payload inside a station.

In addition to his, the Electromechnical cylinder (EMC) can be used as a stand alone module for other applications.

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2.2 Concept

The FlexLifter IRL600 is based on generic scissor lift table concept. However the hydraulic actuator has been replaced by an Electro-Mechanical Cylinder (EMC), to allow for fast movements and high payloads without the constraints of hydraulic actuators. Using a proven servomotor, the FlexLifter is driven by IRC5 robot controller.

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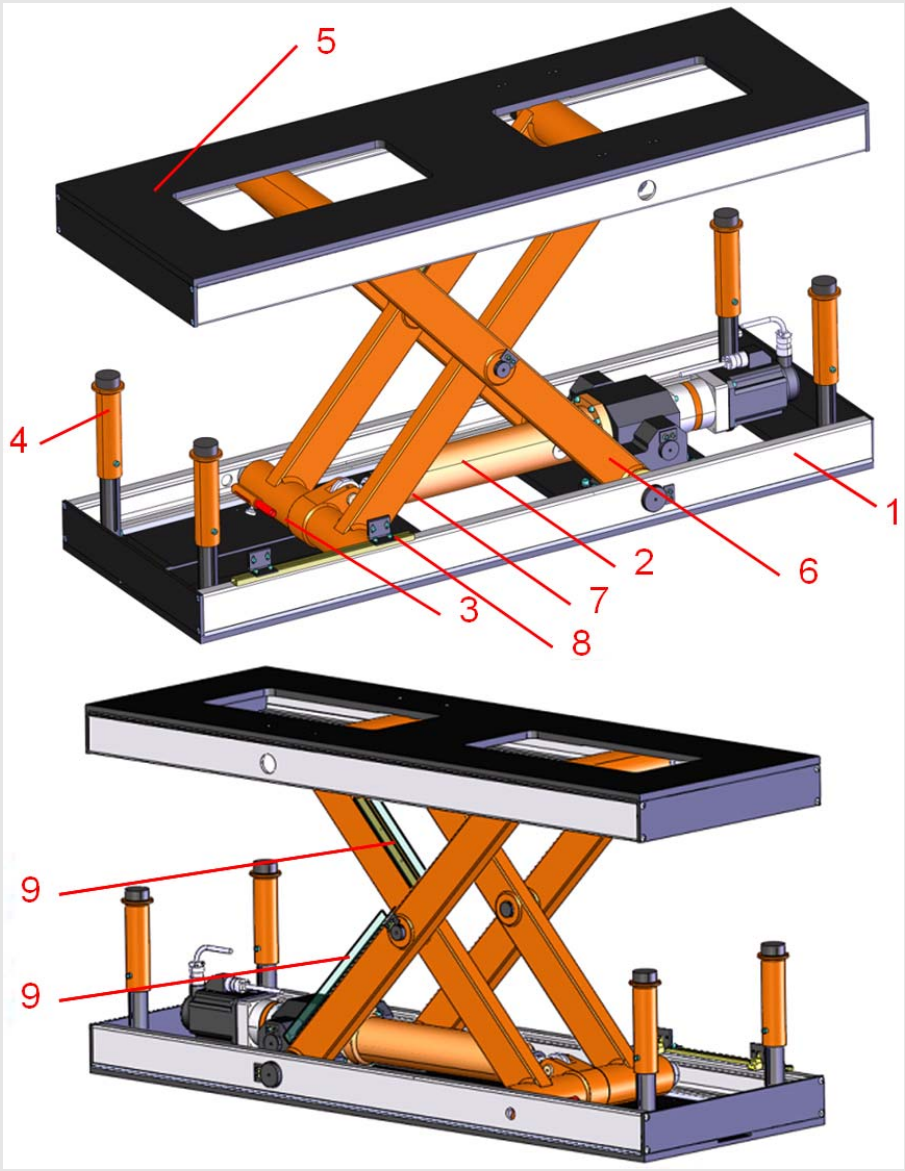
2.2.1. Detailed views

Overview



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1	Base plate
2	Electromechanical cylinder (EMC)
3	Safety pin
4	Spring damper
5	Top plate
6	Outer leg frame
7	Inner leg frame
8	Sensor
9	Cable tray

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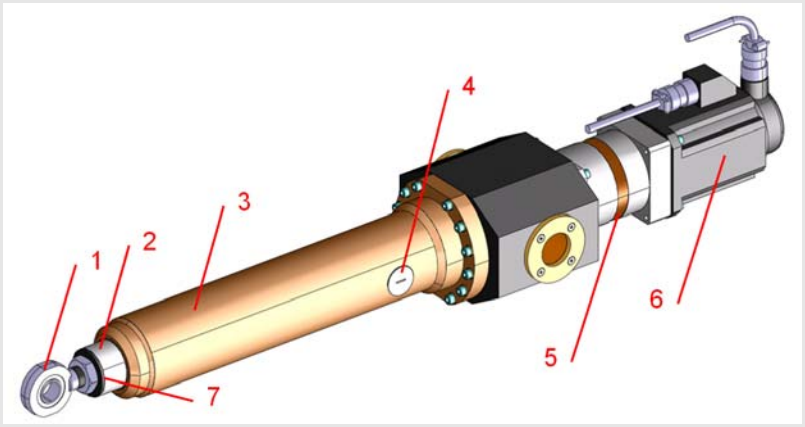
Electromechanical cylinder EMC:



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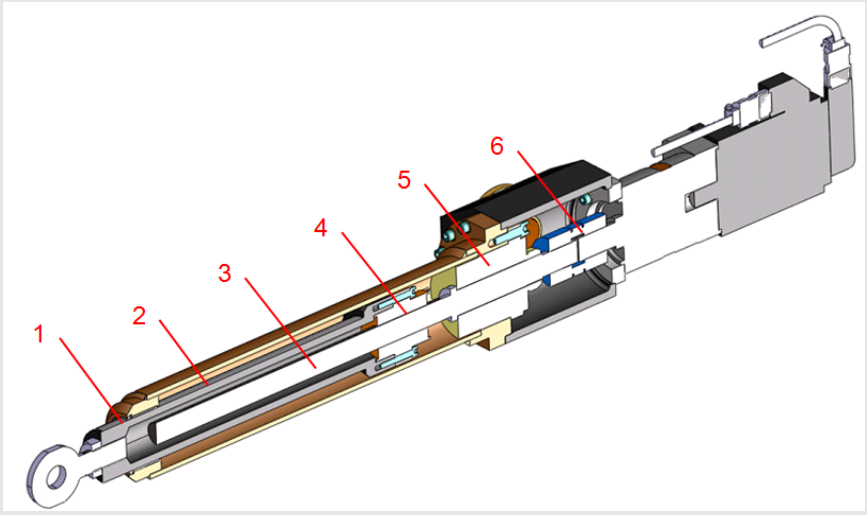
1	Rod end with ball joint
2	Rod
3	Cylinder
4	Grease port
5	Reducer
6	Servomotor
7	Calibration mark

EMC section view:



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1	Front seal
2	Rod
3	Screw
4	Nut
5	Bearings
6	Coupling

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2.3 Terminology

2.3.1. Terms used in this manual

You'll find in the table hereunder some explanations regarding the terms used in this manual:

Designation	Definition
Robotic system	The robot and the track motion.
Robot	The manipulator and the controller.
Manipulator	The 6 axis mechanical unit of the robot.
Controller	The motion system used to control the manipulator & track motion (i.e. ABB IRC5).
Translation unit	The complete carriage assembly including all moving parts (cable chain, lubrication system, sensors, ….).
Carriage	The moving part of the track motion. The top plate receives the tooling / robot.
Track	The static part of the track motion. The track is delivered as modules to be assembled by the customer, as described in *When used as a FlexTrack additional axis on page 61*.
SMB	The Serial Measurement Board is an integrated circuit board used to measure and store the position of each robot axes.
SMB Box	The Serial Measurement Board Box, a control box which includes the SMB card for the FlexLifter axis as well as the resolver position backup battery.

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3 Technical details

3.1. Performances

FlexLifter IRL 600

The following table summarizes the main information regarding the FlexLifter IRL600 performances:

Feature	Performances
Vertical stroke	600 mm
Speed	200 mm/s
Deceleration time	0.4 s
Unidirectional repeatability *	± 1mm
Weight of the unit	700 kg
Max. payload	600 kg
Index of protection	IP 54

* According to ISO 9283 test.

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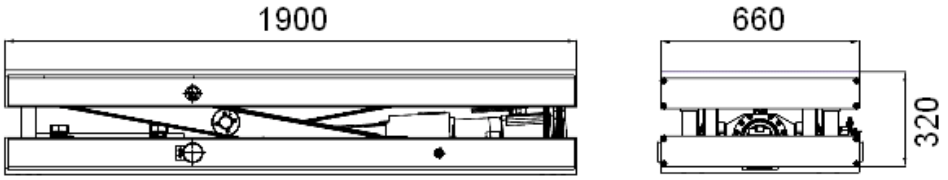
3.2. Overall dimensions

Lower position:



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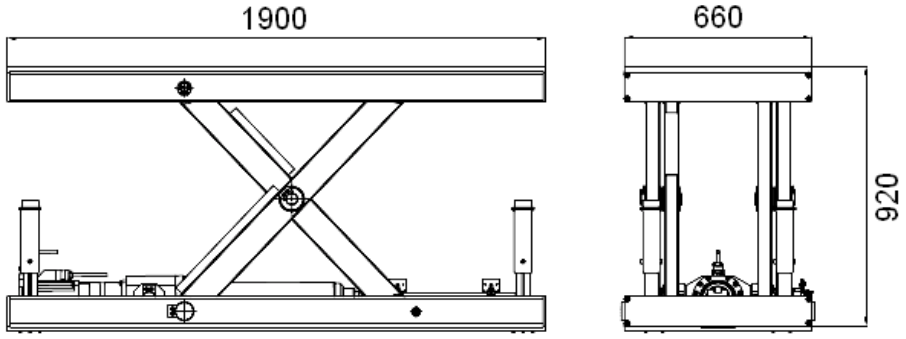
Upper position:



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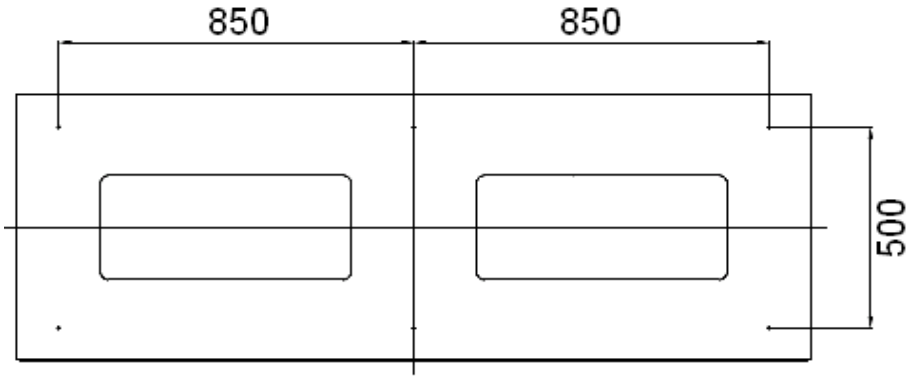
Fixing mask on top plate: 6 holes M12



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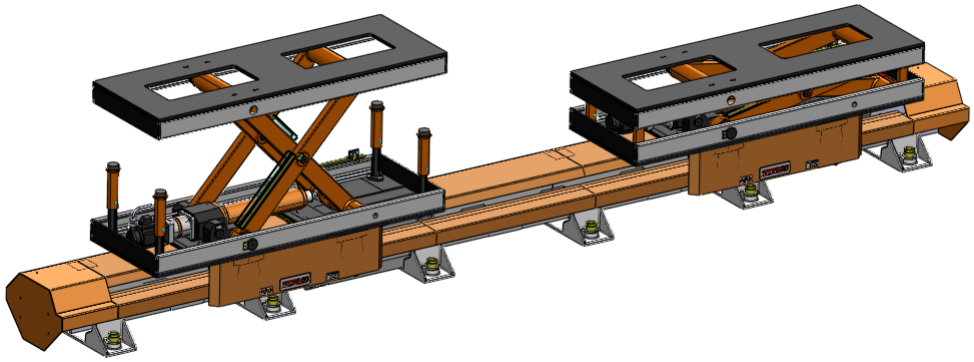
Example of configuration: FlexTrack with 2 carriages + FlexLifter



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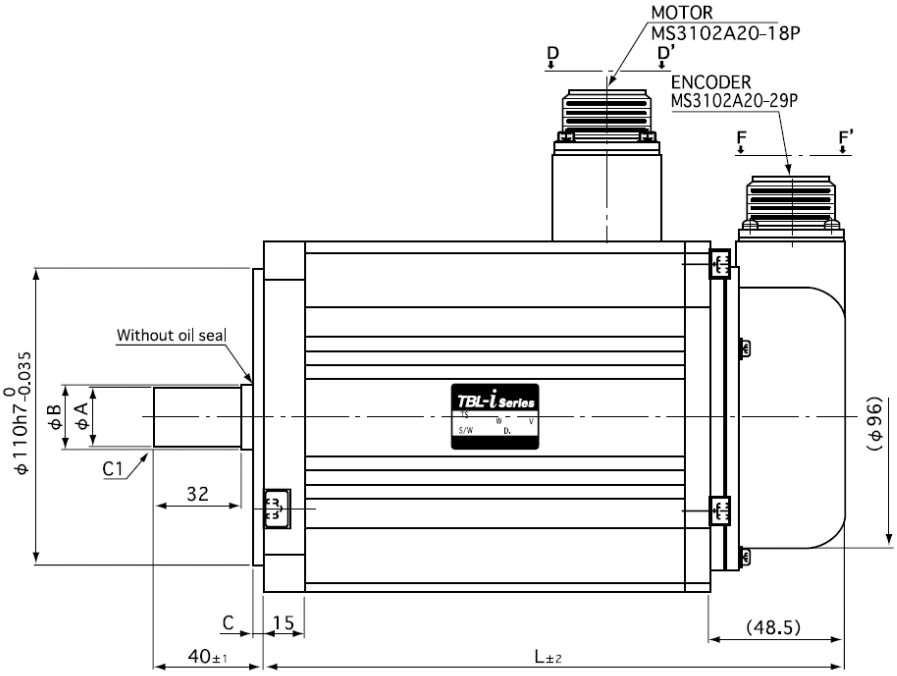
3.3. Motor details

Motor specifications

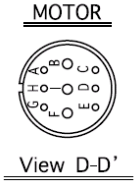
Motor	
Voltage	400 volts
Rated Torque	15.9 N/m at 3000tr/min

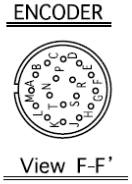
Brake	
Voltage	24 volts
Brake torque	13.5 N/m
Connection socket	REF: MS 3102A20-18P

Resolver	
Connection socket	REF: MS 3106A20-29P



L:	mm	241
Output Shaft:φA	mm	26h6
Shaft:φB	mm	28
Attached spigot:C	mm	6





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3.4 Cables and position sensors

3.4.1. FlexLifter cables

General

When the FlexLifter is mounted onto a standard FlexTrack, no modification of the FlexTrack cabling is required. You do however need to order specific flexible (movement) FlexLifter cables to be added in the cable chain of the FlexTrack.

In the case of a standalone configuration, movement cables or static field cables can be used to connect the FlexLifter to the SMB box.

See *Cabling of the FlexLifter on page 63*.

Dimensions

The FlexLifter static and movement cables are available with lengths of 5, 10 and 15 meters, distance from the controller to the SMB box (static cables) and distance from the SMB box to the FlexLifter motor (movement cable).

Diameter of the movement cables:

	Designation	Diameter
1	Resolver cableMotor	Ø 9.5 mm
2	power cable	Ø 14 mm
3	Position sensor cable	Ø 5.5 mm

See *Cabling of the FlexLifter on page 63*.

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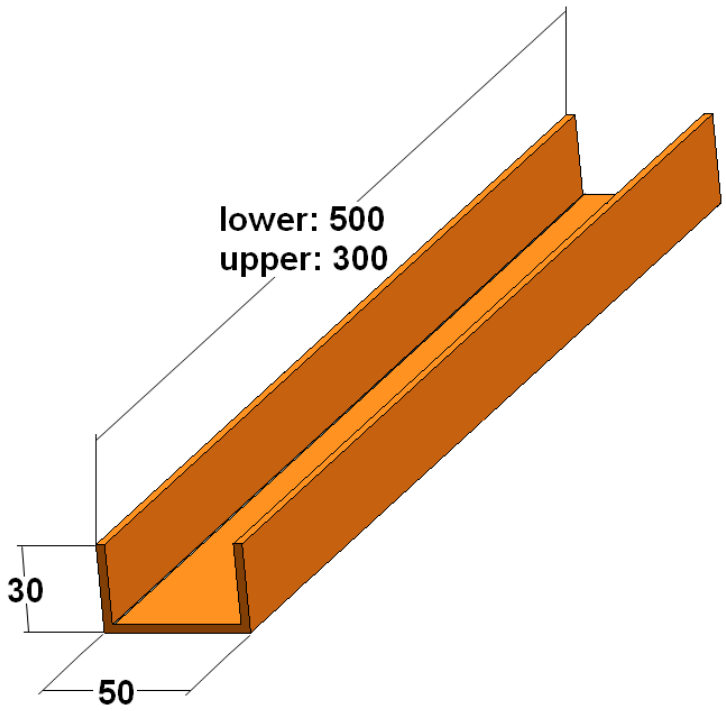
3.4.2. Cable tray

The lower and upper frames of the FlexLifter are equipped with cable trays dedicated to route the cables for the customer's tooling.

See *Routing of the cables on page 67*.

The trays are 50mm wide, 30mm high, and their lengths are respectively 500mm and 300mm.



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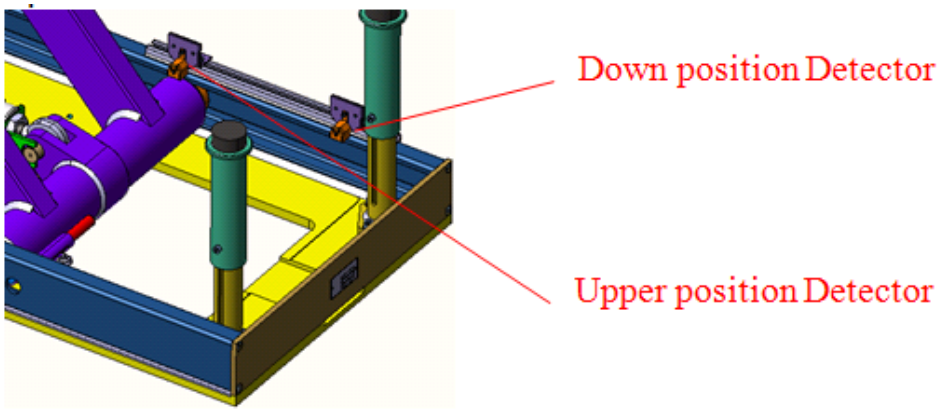
3.4.3. Position sensors

The FlexLifter IRL 600 is equipped with two position sensors to detect the up and down positions. It is also possible to add other sensors to detect intermediate positions. In addition, the EPS option (Electronic Position Switches) of the controller can be used to safely monitor the FlexLifter position in case of manual operation in automatic mode.

For more information regarding EPS, see product specification (Controller IRC5 with FlexPendant and Application Manual Electronic Position Switches, 3HAC027709-001).



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3.5. Robot controller technical requirements

When the FlexLifter is associated with an IRB 6600\7600 robot it behaves like an external axis. However, the robot controller must satisfy some requirements to get an optimum integration. The FlexLifter unit has been designed for ABB IRC5 controller, for compatibility with other control systems please contact ABB.

Requirements in the robot controller

The robot equipment must fulfil the following requirements to integrate an external axis

Item	Option	Comment
IRB 6600 / 7600 Drive module	770-4	Motor drive « W » type.
IRC5 controller	Floppy drive	If the lifter parameters have to be loaded in the controller using a floppy drive, this optional device must be available. It is therefore possible to load the parameters in the controller if this one is not equipped with a floppy drive, please check the controller operation manual.

TIP!

In case of application with IRB 4400 robot or smaller, performances are reduced (speed, acceleration). Please contact ABB.

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4 Unpacking and acceptance

4.1. Unpacking

Inspection

The FlexLifter IRL 600 is wrapped in plastic. Unpack it and check for any visible transport damage. If the FlexLifter is damaged, contact ABB.

Contents

You should find in the standard delivery package (not including options):

- The Flexlifter
- The motor cables
- The product manual

Cleaning

Before transport the FlexLifter IRL 600 has been protected against rust by a thin film of oil that has been applied before packing. This film of oil must be wiped off before installation.

NOTE!

Wipe off any surplus oil using a lint-free cloth.

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4.2. Acceptance inspection

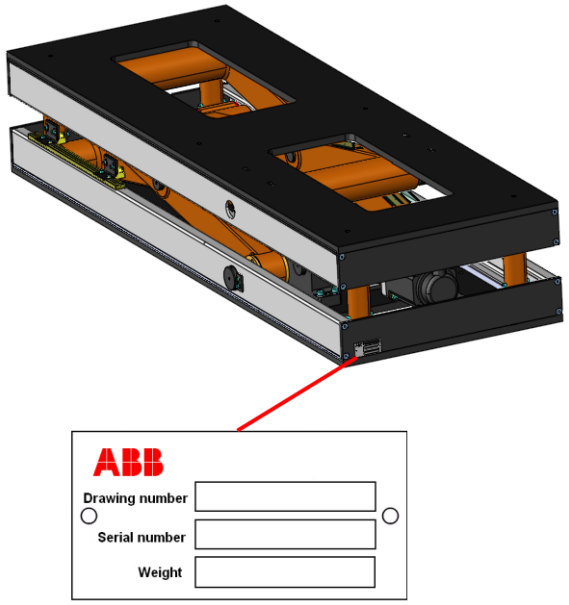
TIP!

Always try to determine if the goods are as ordered, and that the package is not damaged before unpacking the unit.

Identification plate

To identify the delivery, check the identification plate and compare it to the delivery note.

The identification plate is located on the baseplate side (see fig. below) and indicates the FlexLifter type, the serial number and the weight.



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5 Handling

5.1. Lifting weight

FlexLifter delivered as a standalone unit

The weight of a FlexLifter IRL 600 without FlexTrack is 700 kg.

FlexLifter delivered assembled on a section of Flextrack

	IRT 501-66	IRT 501-66R
2 meter section with FlexLifter IRL 600	1336 kg	1516 kg
3 meter section with FlexLifter IRL 600	1491 kg	1612 kg

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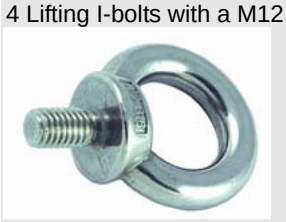
5.2. Lifting the FlexLifter IRL600

Actions before lifting

CAUTION!

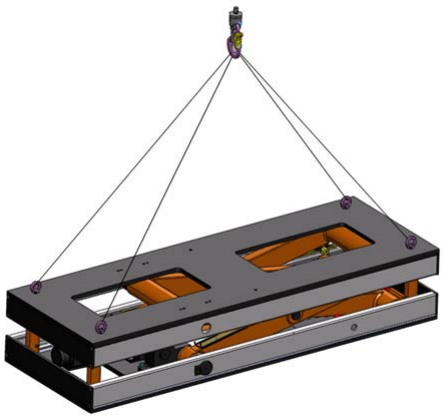
Before lifting the FlexLifter IRL 600, read through the safety instructions carefully.

Handling equipment for FlexLifter delivered as a standalone unit

Type	Recommended equipment
Flexlifter IRL 600	4 Lifting I-bolts with a M12 thread  2 lifting straps with a load capacity of 1 tonne each

Lifting the FlexLifter delivered as a standalone unit

As a standalone unit, the FlexLifter can be safely handled using the appropriate lifting M12 hook & straps:



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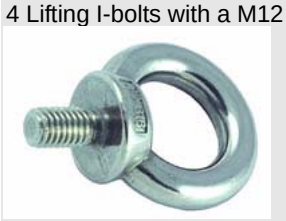
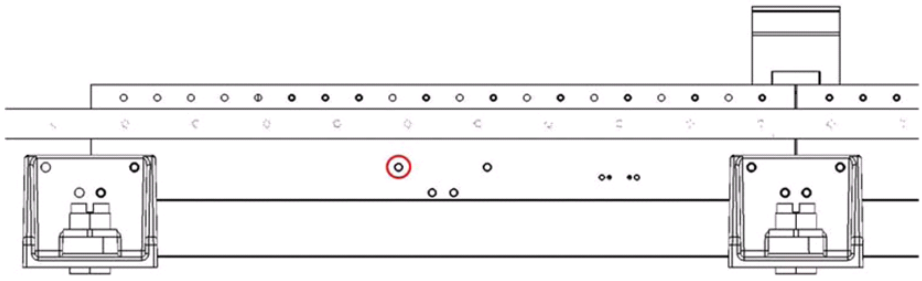
Handling equipment for FlexLifter assembled on a FlexTrack IRT 501-66 or 66R

Type	Recommended equipment
IRT 501–66 with Flexlifter IRL 600	4 U-shackles (shackle has to fit into the bail) 4 Lifting I-bolts with a M12 thread  2 lifting straps (min 5 meters) with a load capacity of 1 tonne each
IRT 501–66R with Flexlifter IRL 600	2 lifting straps (min 5 meters) with a load capacity of 1 tonne each

Lifting FlexTrack IRT 501–66 with FlexLifter

Unmount all covers, including the carrier side covers and screw the I-bolt in the outer holes located between the crossmembers



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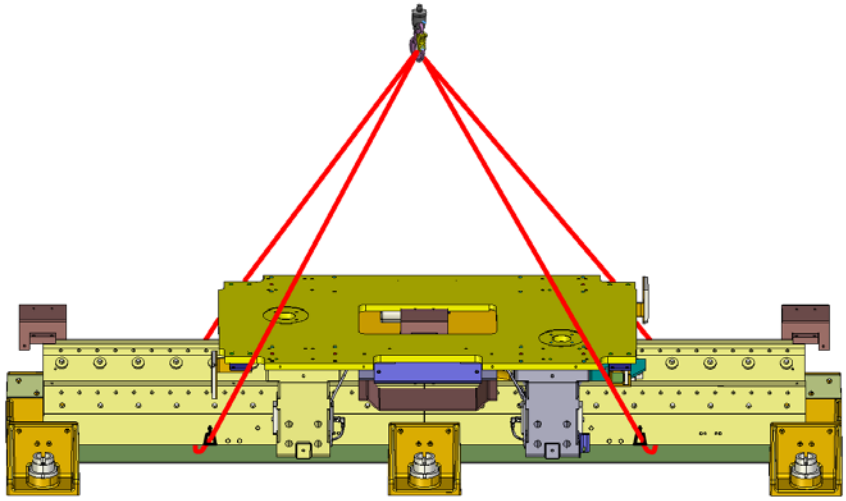
In the following step, one end of a lifting strap should be guided through the shackle, below the sidemembers at both sides and through the second shackle. The second strap should be used for the other side.

The shackle should act as a guidance only to prevent the straps from slipping. The weight of the FlexTrack should be carried by the sidemembers.

The following picture shows a FlexTrack carrier without Flexlifter mounted on, however the principle is identical:



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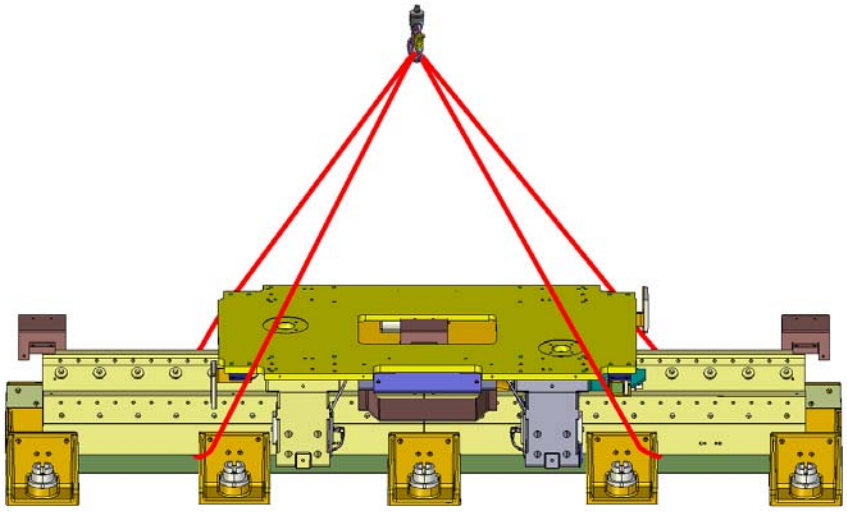
Lifting FlexTrack IRT 501–66R with FlexLifter

The lifting strap should be guided behind the second to last crossmembers below the sidemembers at both sides and through the second shackle. The second strap should be used for the other side.

The following picture shows a FlexTrack carrier without Flexlifter mounted on, however the principle is identical:



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Never place lifting straps wider than a combined angle of max. 60°.

WARNING!

Never lift a track longer than 3m at once. If the track is longer, the track has to be disassembled into smaller sections.

Lifting FlexTrack IRT 501–66R with FlexLifter using a lifting beam

If there is a lifting beam available, the strap should always be located at the middle of the sidemembers.

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5.3 Motor brake release

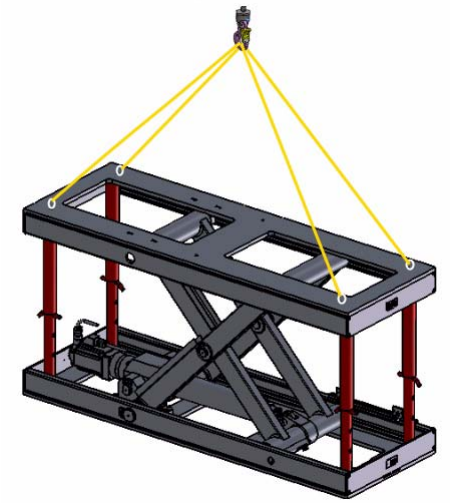
5.3.1. Important information about the brake release

General

You should not need to release the brake during the commissioning or the normal use of the product. If it happens to be however necessary, you can release the brake by either pressing the brake release button on the SMB box or by supplying 24V DC to the right pin of the FlexLifter movement motor power cable.

Before releasing the brake of the FlexLifter, it is necessary to secure the position of the top frame with a handling system or a crane.

If possible, use posts to prevent any unexpected fall dawn of the FlexLifter. Safety posts specifically designed for the FlexLifter IRL 600 are available as spare parts (ABB reference: 3HAW107703535). To install them, remove the spring dampers and replace them with the safety posts, and secure them with the same sets of screws. Proceed one by one.



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WARNING!

Releasing the brake of the FlexLifter without taking the appropriate care can induce a risk of serious injury for the operators.

Before releasing the brake, make sure that nobody is working on the FlexLifter or the FlexTrack.

Do not release the brake when the FlexLifter is loaded – There is a risk of brutal fall down.

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5.3.2. Brake release of the FlexLifter with the SMB box

Instructions for brake release using the SMB box

	Action	Note/Illustration
1.	Make sure that all cables are connected as described in *Electrical setup on page 63*	
2.	Turn the controller on.	
3.	To release the brake, press the brake release button on the back of the SMB box.	

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5.3.3. Brake release of the FlexLifter with external 24V DC

Instructions for brake release using external 24V DC

If no controller is available, or if the controller can not be powered and you need to release the brake, proceed as described below:

	Action
1.	Unplug the FlexLifter movement motor power cable from the SMB box.
2.	Using pins, connect the +24VCC to the G pin (see figure in *Motor details on page 46*)
3.	Connect the 0VCC to the H pin (see figure in *Motor details on page 46*)

WARNING!

The motor brakes of the FlexLifter are phase-dependent. Fault connection can cause damage to vital parts.

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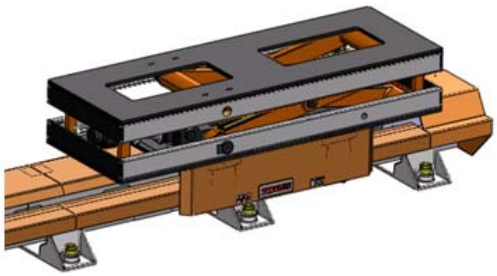
6 Installation

6.1 Fixing the FlexLifter

6.1.1. When used as a FlexTrack additional axis

When the FlexLifter is used as an additional axis to the FlexTrack, it is delivered already preassembled on the track carriage:



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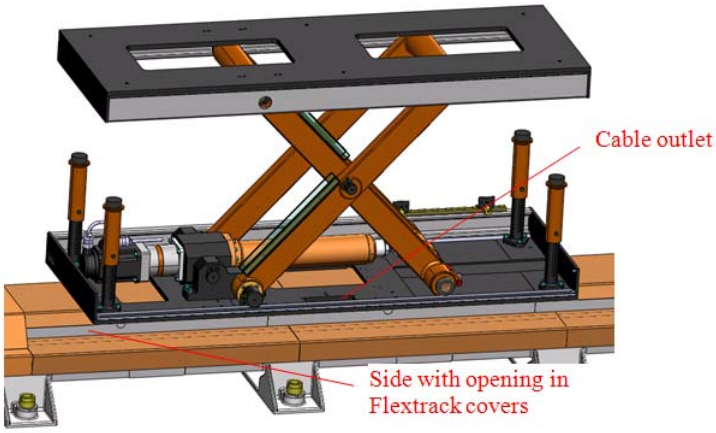

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NOTE!

If you need to assemble the Flexlifter on the carriage, take care of the positioning of the cable outlet: a specific opening is prepared in the base plate in order to route the cables thru the FlexTrack internal cable chain.

(see also *Routing of the cables on page 67*)

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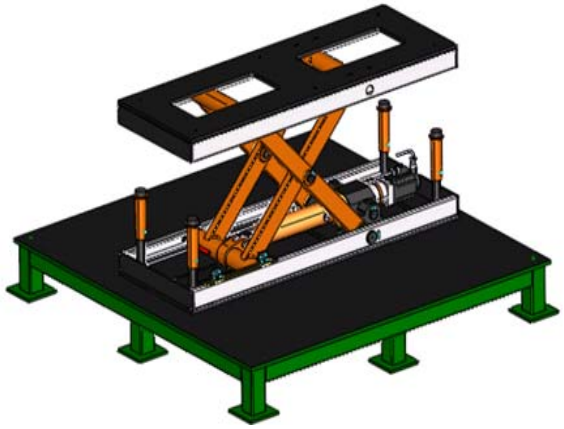
6.1.2. When used as a stand alone unit

WARNING!

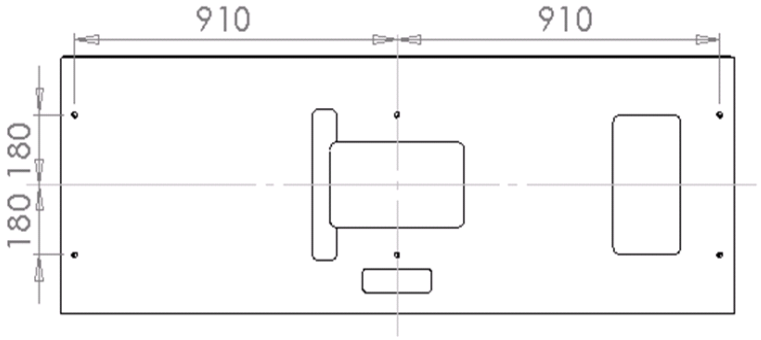
When used as a stand alone module, the FlexLifter is secured to the tooling plate and the levelling is done using the levelling screws of the tooling. No direct fixing on the floor is allowed.

The FlexLifter is not designed to be directly secured to the ground floor. It is necessary to have a tooling slab under the baseplate, in order to have levelling means.



en2010110200017

The FlexLifter is linked to the slab with 6 M12 screws, the fixing mask in the lower plate is as follows:



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The levelling of the FlexLifter is depending on the levelling of the slab. The FlexLifter inclination should not exceed 1mm for 1m.

The slab should also have one hole prepared for the cable routing.

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7 Electrical setup

7.1 Cabling of the FlexLifter

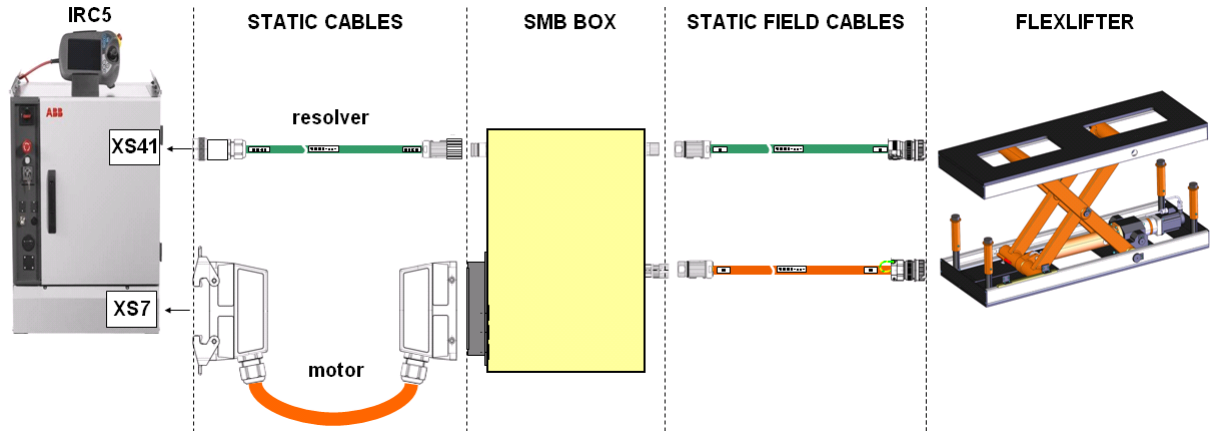
7.1.1. Stand alone configuration

Description

FlexLifter is designed to be driven by the ABB IRC5 robot controller. However alternative control systems are possible, please contact ABB.

The SMB is usually located near the FlexLifter base. It is possible to use standard robot cables from the SMB to the controller (floor cables). Other standard cables are also available as options (i.e.Fieldbus, air hose, IOs), please refer to the "FlexLifter Standard Product Offer" for part number.

Wiring diagram



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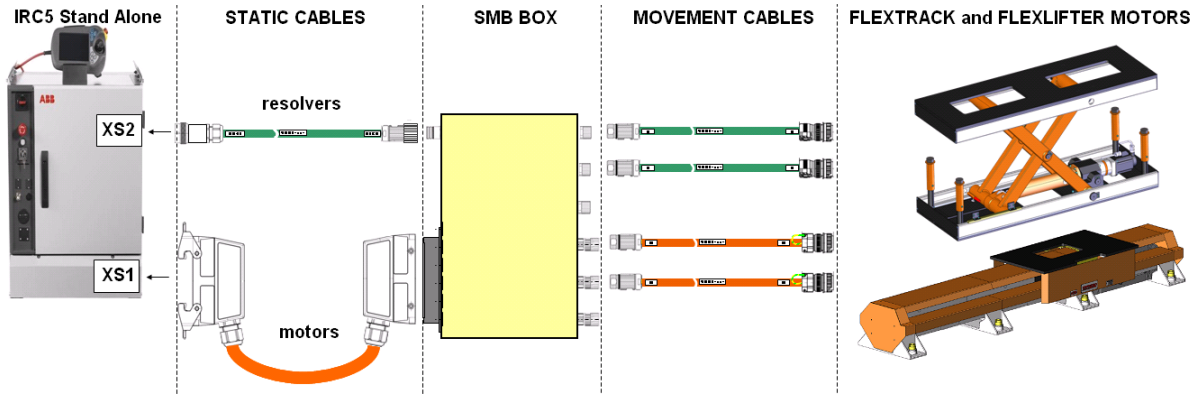
7.1.2. FlexLifter on FlexTrack

Description

When the FlexLifter is used on top of a FlexTrack carriage, flexible cables are required in FlexTrack's cable chain. The SMB is usually located near the FlexTrack way. It is possible to use standard robot cables from the SMB to the controller (floor cables).

Wiring diagram



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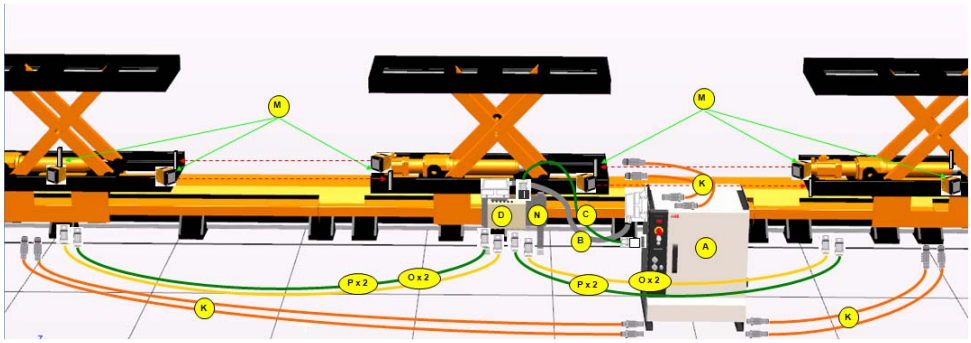
7.2 Architecture example

7.2.1. Overview

Please find below the necessary material for a typical configuration using 3 Flextrack & 3 Flexlifters:



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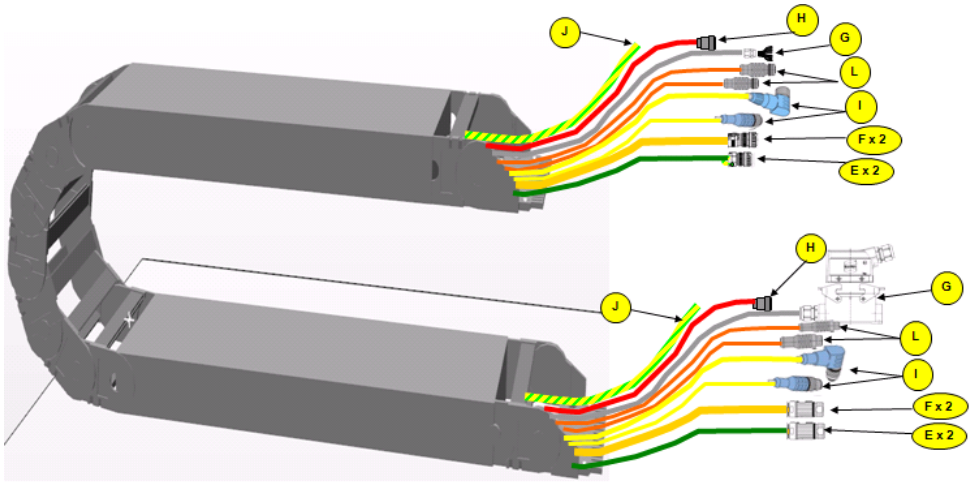
The detailed cable chain (1 per Flextrack):



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Designation	qty	Rep
IRC5 6 axes 3V3W	1	A
Static Measure link cable	1	B
Power Cable	1	C
SMB 6 axes	1	D
Extension motor cable	4	O
Extension resolver cable	4	P
Mvt motors cable	6	E
Mvt resolver cable	6	F
Mvt 4 position switch cable	3	G

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7.2.1. Overview

Designation	qty	Rep
Air pipe	3	H
Mvt profinet cable & PS	6	I
Mvt PE cable	3	J
Static Laser cable	6	K
Mvt Laser cable	6	L
Anticollision (option)	6	M
SMB Support	1	N

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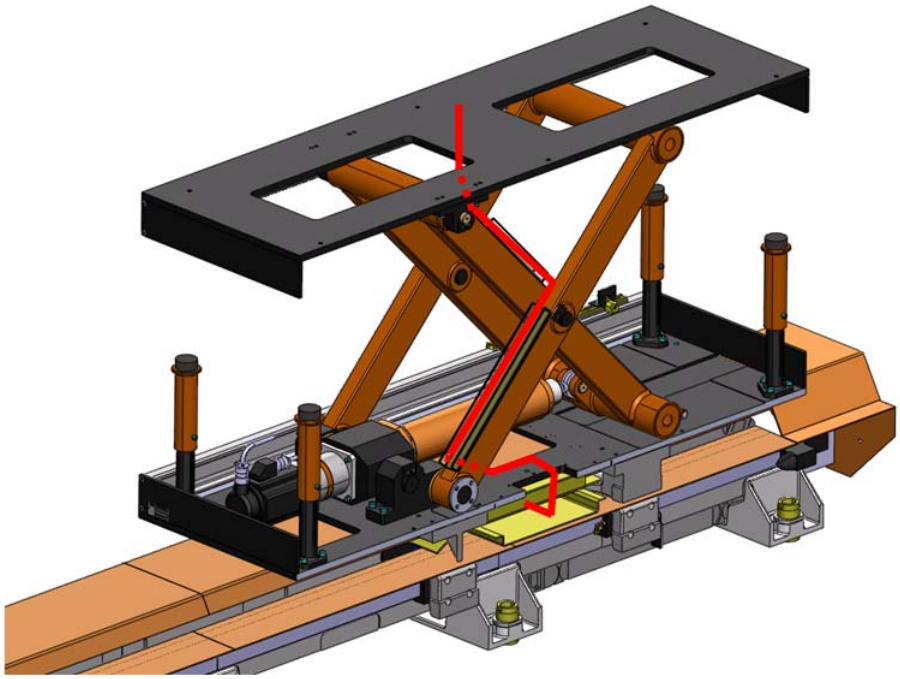
7.2.2. Routing of the cables



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7.2.3. SMB box

SMB means Serial Measurement Board. The SMB board is available in 3 versions, for 1,3 & 6 axis. The cables from the axis motors (FlexTrack, FlexLifter,…) are connected to the SMB box. The SMB is connected to the controller with 2 static cables.

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NOTE!

Check that there's enough space to install the SMB box at layout time.

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8 Setup and commissioning

8.1. Pre-requirements

Hereunder are listed the required operations before starting up the FlexTrack setup :

	Actions	Info/Illustration
1	Configure the controller	Load the FlexLifter parameters and configure the controller as described in *Loading the FlexLifter parameters on page 71*.
2	Installation of the FlexLifter	Check that the FlexLifter is installed and levelled as described in *Fixing the FlexLifter on page 61*.
3	Manual lubrication	FlexLifter is lubricated at ABB facility during assembly. However if you need to manually lubricate the roller screw, see *Lubrication on page 74*.
4	Synchronization	Like any other robot axis, the FlexLifter motor must be calibrated using the FlexPendant, see *Calibration on page 76*.
5	Checklist	The *Checklist before first run on page 79* gives instructions about points to check before switching to auto mode.

Ambient temperature

Description	Standard/Option	Temperature
During operation	Standard	+ 5°C (41°F) to + 50°C (122°F)
For the controller	Standard	+ 5°C (41°F) to + 45°C (113°F)
For the controller	Option	+ 5°C (41°F) to + 52°C (126°F)
For short periods (not exceeding 24 hours)	Standard	up to + 70°C (158°F)

Relative humidity

Description	Relative humidity
During transportation and storage	Max. 95% at constant temperature
During operation	Max. 95% at constant temperature

Preparations

The following steps should be carried out before starting the FlexTrack IRT 501.

	Action	Note
1.	Unpacking and acceptance.	Compare the delivery check to the identification plate and verify for acceptance according to *Acceptance inspection on page 52*.
2.	Lifting.	Lifting FlexLifter IRL 600 using lifting slings, see *Lifting the FlexLifter IRL600 on page 54*.
3.	Preparation for assembly.	
4.	Assemble the lifter.	

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8.1. Pre-requirements

	Action	Note
5.	Assemble the manipulator.	
6.	Electrical installation.	
7.	Software installation.	

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8.2 Configure the controller

8.2.1. Loading the FlexLifter parameters

It is necessary to load the FlexLifter parameters in the controller using the floppy disk supplied in the delivery package. This procedure is described in details in the robot controller operation manual. Hereunder are listed the actions related to the FlexLifter specifics:

	Actions
1	Select the menu option : Add new parameters.
2	Load the file MOC_Ta _DMb_Mc_Ld_Ne.cfg .

NOTE!

The filename contains information about the FlexLifter configuration.

« a »: type of track, « b » : # of drive module, «c » : # of the motor, « d » : # of the SMB, « e » : # of the node used by the SMB.

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8.2.2. Offset parameters

The offset parameters for the FlexLifter IRL 600 are factory parameters, and should not be modified on site.

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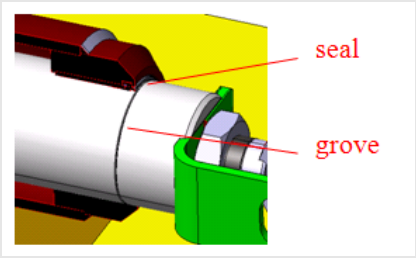
8.2.3. Zero position

The stroke limits parameters are related to the zero position, which is indicated by a small grove in the cylinder shaft. Align the grove with the seal when synchronizing the axis (see fig. below).

To move the axis to the zero position, align the grove in the cylinder rod with the seal, then follow the *Calibration on page 76*.



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8.3 Lubrication

Only the roller screw nut needs to be lubricated on the Flexlifter 600:

8.3.1. Lubrication with basic delivery package

WARNING!

Use lithium soap flowable grease, class NLGI 0, with a mineral oil base, doped with EP (extreme pressure) additives.

The base oil viscosity must be ISO VG68 to ISO VG 100.

Grease doped with EP additives is absolutely necessary, due to high loads on slides.

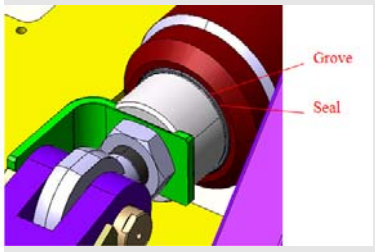
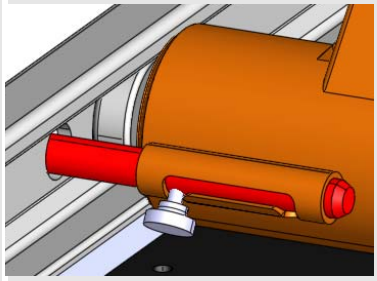
The roller screw nut is equipped with a standard grease port.

Inject the grease with a manual or air operated pump following the instructions below

The required grease type is indicated below:

Supplier	Lubricant
CASTROL	Longtime PD 0
KLÜBER	Microlube GB 0
TOTAL	MULTIS EP 0

Procedure

Steps	Action	Info/Illustration
1.	Switch the robot controller to manual mode.	
2.	If not already done, jog the axis to the zero position (see *Zero position on page 73*)	
3.	Lock the safety pin (see *Safety instructions during mechanical assembly on page 35*)	
4.	Switch off the power on the installation (see *Safety for electrical operations on page 36*)	

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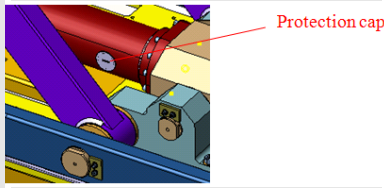
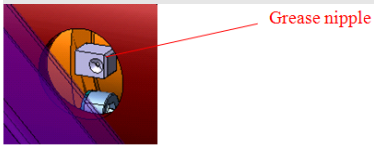
Steps	Action	Info/Illustration
5.	Remove the protection cap from the cylinder.	
6.	Locate the grease nipple and connect the grease pump.	
7.	Inject 14 cm³ of grease into the roller nut.	
8.	Disconnect the pump and put the protection cap back on.	
9.	Make sure that no tool has been left in the FlexLifter and unlock the safety pin.	
10.	Switch the controller on in manual mode and gently jog the FlexLifter to make sure that there is no mechanical interference.	

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8.4 Calibration

8.4.1. Overview

General

This chapter includes general information about the calibration method and also details procedures that do not require specific calibration equipment.

When the robot system must be recalibrated, it is done according to the documentation enclosed with the calibration tools.

WARNING!

Check first that nobody stands in the FlexLifter area, and that nothing has been left (i.e. tool) inside the FlexLifter frame. Make sure that the machines have been correctly installed.

NOTE!

The FlexLifter does not need to be calibrated during restart. The resolvers only need to be calibrated when commissioning the system.

When to calibrate

The FlexLifter axis must be calibrated each time the contents of the revolution counter are changed or lost:

If resolver values are changed, the robot must be recalibrated using the calibration methods supplied from ABB. Calibrate the FlexLifter IRL 600 carefully with standard calibration.

The resolver values will change when parts affecting the calibration position are replaced on the FlexLifter IRL 600, e.g. motor, or part of transmission.

If the contents of the revolution counter memory are lost, the counters must be updated. This will occur when:

- the battery is discharged
- a resolver error occurs
- the signal between a resolver and measurement board is interrupted
- a robot axis is moved with the control system disconnected

The revolution counters must also be updated after the robot and controller are connected at the first installation.

Power failure

There's no need to calibrate the FlexLifter after a power failure, the backup battery included in the SMB box will store the resolver position until power is restored.

NOTE!

The resolvers only need to be calibrated when commissioning the system.

Fine calibration

The system has been tuned before delivery. The calibration offset value is set to 0 and is stored in the controller data and the SMB Box. No fine calibration is required on the FlexLifter IRL 600.

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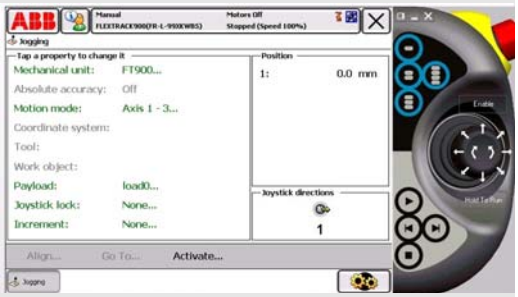
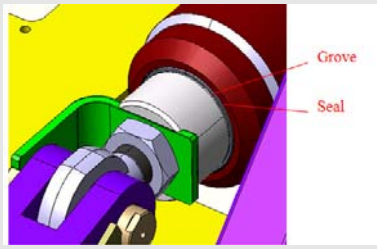
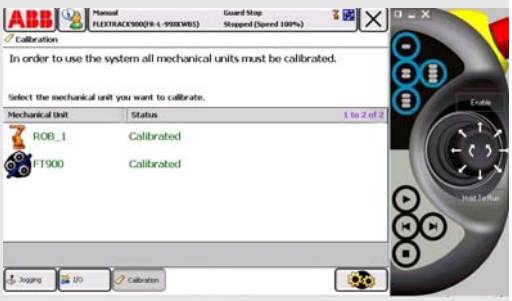
8.4.2. Calibration instructions

Procedure

This procedure must be applied at the first start, after mechanical intervention (e.g. motor or reducer replacement), or if the contents of the revolution counter are changed or lost:

Steps	Action	Info/Illustration
1.	Using the FlexPendant, jog the cylinder rod in order to align the grove with the seal.	 en2010110200028
2.	The grove and the seal must appear aligned as shown on the figure.	 en2010110200029
3.	On the FlexPendant, tap on the ABB logo : select « Calibration ».	en2010110200030
4.	Select the external axis (here, FT900).	 en2010110200031

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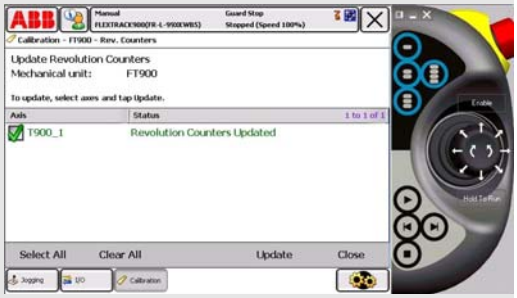
8.4.2. Calibration instructions

Steps	Action	Info/Illustration
5.	Tap the axis checkbox to highlight the axis to be calibrated.	 en2010110200032
6.	Tap « Update ».	 en2010110200032
7.	After a few seconds, the FlexPendant indicates that the external axis has been calibrated.	 en2010110200034

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8.5. Checklist before first run

WARNING!

Check carefully the working envelope of the Flexlifter unit manually before switching to auto 100%.

Checking the working envelope of the lifter

Using the FlexPendant, jog the carriage in order to verify that:

- The lifter can reach the extreme positions without mechanical interference
- The sensors are detecting the lifter as required by the process
- No cable is damaged, rubbed or constrained by the lifter movements
- There is no abnormal noise or wear.

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9 Periodical and preventive maintenance

9.1. Maintenance planning

Even if the Flexlifter 600 has been designed to require a very few maintenance operations, it is important to check the points mentioned hereafter and respect the maintenance time intervals.

Time interval	Item	Maintenance	More info.
Every 3 months	Roller Screw	Lubrication of the roller screw nut	*Lubrication of the roller screw nut on page 81.*
Every 6 months	Safety Lock	Check the good condition of mechanical locking pin	*Safety instructions during mechanical assembly on page 35*.
	Emergency stop feature	Check that all safety features are operational	*Verification of the emergency stop feature on page 86*
	Cables and electrical cabinets.	Visual inspection of cables & electrical cabinets envelope	*Verification of the cables on page 88*
Every year	Rollers	Visual inspection of the rollers & rails	*Rollers on page 84*
Every 3 years	SMB Backup battery	Replace the SMB backup battery	*SMB backup battery on page 90*

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10 Instructions for maintenance

10.1 Maintenance of the mechanical components

10.1.1. Lubrication of the roller screw nut

WARNING!

Use lithium soap flowable grease, class NLGI 0, with a mineral oil base, doped with EP (extreme pressure) additives.

The base oil viscosity must be ISO VG68 to ISO VG 100.

Grease doped with EP additives is absolutely necessary, due to high loads on slides.

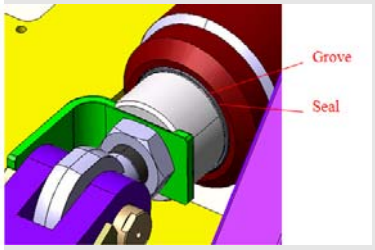
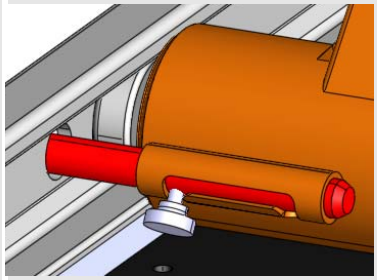
The roller screw nut is equipped with a standard grease port.

Inject the grease with a manual or air operated pump following the instructions below

The required grease type is indicated below:

Supplier	Lubricant
CASTROL	Longtime PD 0
KLÜBER	Microlube GB 0
TOTAL	MULTIS EP 0

Procedure

Steps	Action	Info/Illustration
1.	Switch the robot controller to manual mode.	
2.	If not already done, jog the axis to the zero position (see *Zero position on page 73*)	
3.	Lock the safety pin (see *Safety instructions during mechanical assembly on page 35*)	

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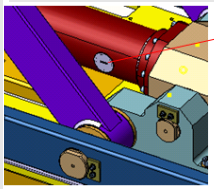
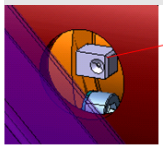
10.1.1. Lubrication of the roller screw nut

Steps	Action	Info/Illustration
4.	Switch off the power on the installation (see *Safety for electrical operations on page 36*)	
5.	Remove the protection cap from the cylinder.	 Protection cap
6.	Locate the grease nipple and connect the grease pump.	
7.	Inject 14 cm^3 of grease into the roller nut.	
8.	Disconnect the pump and put the protection cap back on.	
9.	Make sure that no tool has been left in the FlexLifter and unlock the safety pin.	 Grease nipple
10.	Switch the controller on in manual mode and gently jog the FlexLifter to make sure that there is no mechanical interference.	

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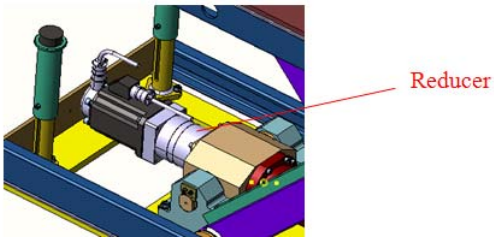
10.1.2. Reducer

The reducer is filled with synthetic oil for the internal lubrication. The quantity of oil in the gear is planned for the gear's lifetime.



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However, if you need to refill the gear with oil for any reason, you must use one of the recommended synthetic oils below (ISO VG 220):

Supplier	Reference
MOBIL	SHC 630
SHELL	Omala HD 220
TOTAL	Carter SH 220

The manufacturer of the gear is recommending the following actions :

Actions	1st use	After 500 hours / 3 months	Every 3 months	Every year
Visual inspection	X	X	X	
Verification of the tightening torque	X	X		X

Visual inspection

- Check that there's no mark of wear or damages to the gear
- Check that there's no oil leak.

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10.1.3. Rollers

The lifter frames are guided using heavy duty rollers. Those rollers are lubricated for the Flexlifter lifetime.

Visual inspection

- Check that there's no wear or damages to the rollers.
- Check that there's no wear or damages to the rails.

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10.1.4. Lifetime of main components

- Roller screw: 1.150.000 cycles (one cycle = lift up & down)
- Dry bushings: 4.595.567 cycles
- Rollers: 50.000.000 cycles

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10.2 Maintenance of electric equipments

10.2.1. Verification of the emergency stop feature

The emergency stop feature must be checked every 6 months, please proceed as follow:

Steps	Actions
1.	Start with the lifter in lower position.
2.	With the FlexLifter powered, but not moving.
3.	Press the emergency stop button.
4.	The brake is applied, you should hear the noise in the motor area.
5.	If the brake is correctly applied, the lifter stands still.
6.	If not, the lifter might move downward & stop on the spring bumpers. In this case check the cabling of the brake, or replace the motor & redo the test.
7.	Proceed with the required validations in the control system to switch back to auto mode.

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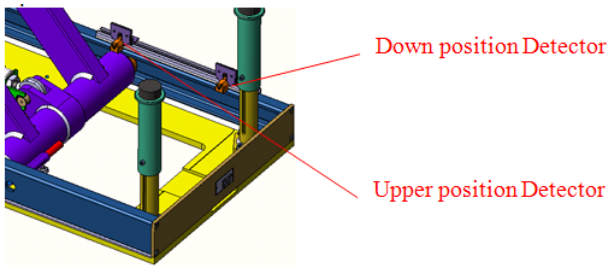
10.2.2. Position sensors

It is necessary to verify that the position sensors are still active every 6 months:



en2010110200036

Steps	Actions
1.	Switch to manual mode
2.	With the teach pendant, jog the lifter up & down.
3.	Check that the sensors are detecting the lifter position (LED on sensor + signal in control system). If not, adjust the sensor position, verify the cabling, or replace the sensor.

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10.2.3. Verification of the cables

Every 6 month verify the Flexlifter cabling:

If you find a cable …	You should…
… with damages or destruction of the external envelope due to wear by rubbing on a fixed part.	Replace the cable, remove the cause of the wear, or route the cable in a different way.

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10.2.4. Verification of the connectors

Once a month verify that all the connectors on the controller, the SMB box and the motor are firmly tighten, and that there's no damage to the cable outlet.

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10.2.5. SMB backup battery

The SMB box includes a battery pack to save the resolver information in case of a power failure.

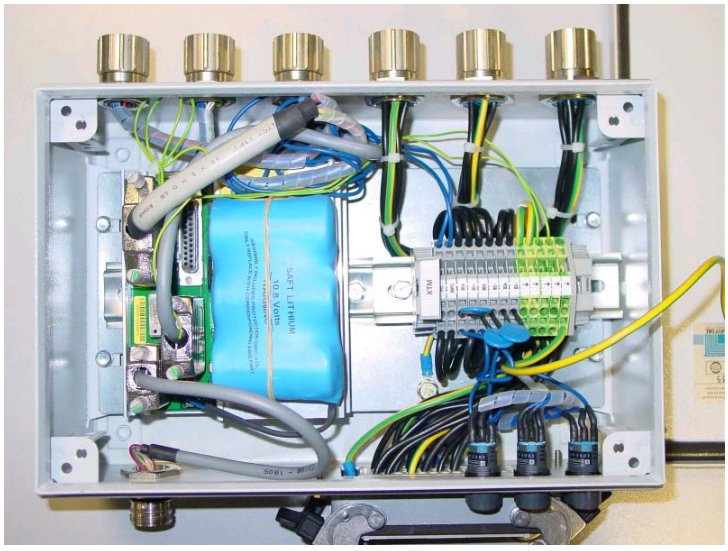
The reference of the battery pack is 3 HAC 16831-1.

It is recommended to replace the backup battery every 3 months, or when the following error code is displayed on the teach pendant screen: 38213.

More information about this error code can be found in the robot controller documentation.

To replace the battery pack, proceed as follow:

Steps	Actions
1.	Position first the carriage in the synchronization position (align the synchronization gauges).
2.	Switch off the power on the SMB box.
3.	Open the SMB box and locate the battery (see fig. below).
4.	Cut the plastic straps.
5.	Unplug the 2 wires cable from the board and remove the battery pack.
6.	Place the new battery pack, plug the connector on the board, and secure the pack with straps.
7.	Close the SMB box, switch on the power.
8.	calibrate the axis as described in *Calibration on page 76*



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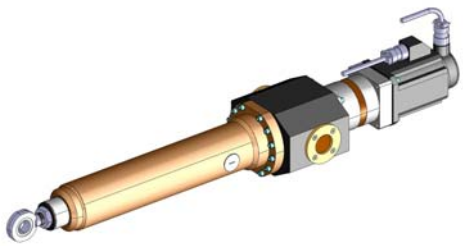
11 Maintenance operations

11.1. Motor or gearbox failure

In the situation where there is a failure to the EMC cylinder, motor or gearbox, it is possible to disassemble the complete electromechanical cylinder in order to maintain it easily. In this procedure presume that it is no longer possible to move the lifter.



en2010110200038

en1011003	Warning: Risks of electric shock	First shutdown the controller and isolate the FlexLifter from the main power.

DANGER!

There is a risk of deadly injuries for the operators and/ or irreversible damage to the product if the safety rules are not respected.

Steps	Actions	Info/Illustration
1.	Remove any load from the top plate of the FlexLifter.	
2.	If possible, jog the FlexLifter such as the safety pin can be engaged.	
3.	Secure the top frame with a handling system or a crane. Slightly pull-up the upper frame in order to cancel the load constraint on the lower structure and the cylinder. If possible, engage the safety pin. Use posts to prevent any drop of the top plate. Safety posts specifically designed for the FlexLifter IRL 600 are available as spare parts (3HAW107703535). To install them, remove the spring dampers and replace them with the safety posts, and secure them the same sets of screws. Proceed one by one.	en2010110200039
4.	Disconnect the motor cables.	

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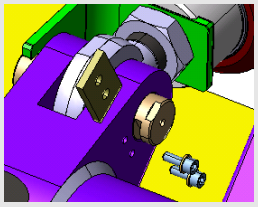
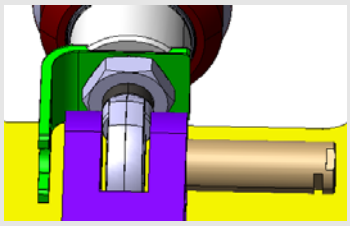
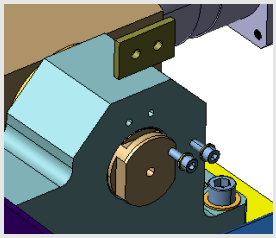
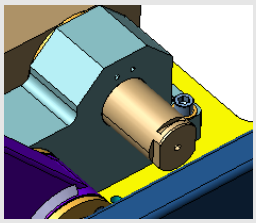
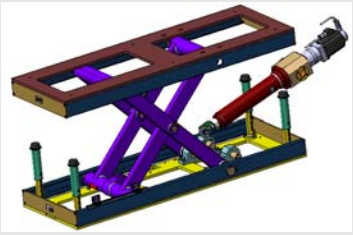
Steps	Actions	Info/Illustration
5.	Remove the locking plate securing the spherical joint axis.	 en2010110200040
6.	Escape the axis from the spherical joint (you do not have to completely remove the axis). You can use an extractor to help you in this process (a threaded hole in the axis is prepared for the extractor). The axis should easily slide out; otherwise it means that there is still a constraint from the load above.	 en2010110200041
7.	Remove the locking plate securing the clevis axes (both sides).	 en2010110200042
8.	Pull out the clevis axes (you do not have to completely remove the axes) in order to free the clevis. Here also the axes are prepared for extractor with a treaded hole.	 en2010110200043
9.	Pull out the complete cylinder from the lifter structure. The weight of the electromechanical cylinder is 82 kg.	 en2010110200044
10.	Lay down the complete electromechanical cylinder on a workbench. Unclamp the shrink disc of the coupling between motor & reducer.	en2010110200045

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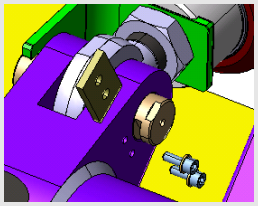
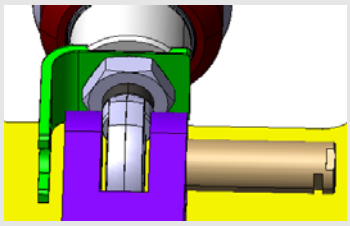
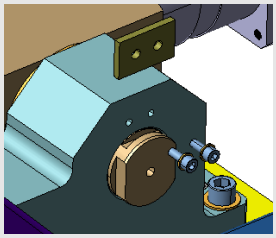
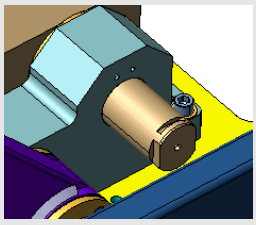
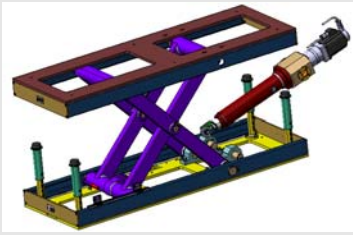
Steps	Actions	Info/Illustration
5.	Remove the locking plate securing the spherical joint axis.	 en2010110200040
6.	Escape the axis from the spherical joint (you do not have to completely remove the axis). You can use an extractor to help you in this process (a threaded hole in the axis is prepared for the extractor). The axis should easily slide out; otherwise it means that there is still a constraint from the load above.	 en2010110200041
7.	Remove the locking plate securing the clevis axes (both sides).	 en2010110200042
8.	Pull out the clevis axes (you do not have to completely remove the axes) in order to free the clevis. Here also the axes are prepared for extractor with a treaded hole.	 en2010110200043
9.	Pull out the complete cylinder from the lifter structure. The weight of the electromechanical cylinder is 82 kg.	 en2010110200044
10.	Lay down the complete electromechanical cylinder on a workbench. Unclamp the shrink disc of the coupling between motor & reducer.	en2010110200045

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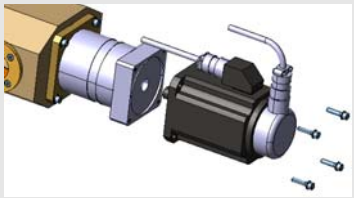
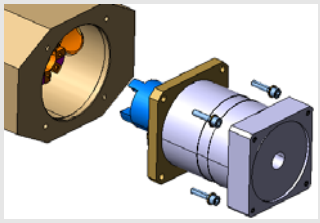
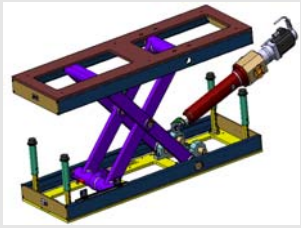
11.1. Motor or gearbox failure

Steps	Actions	Info/Illustration
11.	Remove the 4 screws and pull out the motor.	 en2010110200046
12.	If the problem comes from the reducer, remove the 4 screws and pull it out.	 en2010110200047
13.	Remove the reducer flange. Remove the coupling, and install the new reducer. The tightening torque of the coupling shrink disc is 6Nm.	en2010110200048
14.	Install the new motor and reducer. The threaded pin of the coupling must be tightened to TA1 = 45 Nm. (Width across flats of threaded pin (B)=6mm)	en2010110200045
15.	Install the electromechanical cylinder back in position in the lifter, following the steps 9 to 5 in reverse order. Make sure that not tool has been left in the lifter frame.	 en2010110200045
16.	Connect the cables to the motor	
17.	Unlock the safety pin and remove the safety posts. Slowly release the load from the crane.	
18.	Run a test at low speed.	
19.	Calibrate the FlexLifter as described in section *Calibration on page 76* .	

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12 Spare parts for maintenance

12.1. Mechanical spare parts

ABB part reference no.	Description
3HAW107703535	Set of 4 safety posts
3HAW107703590	Complete electro-mechanical cylinder (includes servomotor)
3HAWC117059	Reducer
3HAWC117034	Coupling
3HAWC117040	Ball joint (for cylinder end)
3HAWL000401	Seal (for cylinder end)
3HAW107703518	Manual lock cylinder
3HAWC117048	Latch for manual lock cylinder
3HAWC103477	Hard stop bumper for spring damper

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12.2. Electrical spare parts

ABB part reference no.	Description
3HAWC116592	Servomotor
3HAW050008604	SMB box 1 axis M2008
3HAW050008605	SMB box 3 axis M2008
3HAW050008606	SMB box 6 axis M2008
3HAW050008608-005	1 axis motor movement cable 5m
3HAW050008608-010	1 axis motor movement cable 10m
3HAW050008608-015	1 axis motor movement cable 15m
3HAW050008609-005	1 axis resolver movement cable 5m
3HAW050008609-010	1 axis resolver movement cable 10m
3HAW050008609-015	1 axis resolver movement cable 15m
3HAW050008613-005	1 axis motor static cable 5m
3HAW050008613-010	1 axis motor static cable 10m
3HAW050008613-015	1 axis motor static cable 15m
3HAW050008614-005	3 axis motor static cable 5m
3HAW050008614-010	3 axis motor static cable 10m
3HAW050008614-015	3 axis motor static cable 15m
3HAW050008615-005	6 axis motor static cable 5m
3HAW050008615-010	6 axis motor static cable 10m
3HAW050008615-015	6 axis motor static cable 15m
3HAW050008612-005	6 axis resolver static cable 5m
3HAW050008612-010	6 axis resolver static cable 10m
3HAW050008612-015	6 axis resolver static cable 15m
3HAWC107034	Position sensor
3HAWC116986	Movement sensor cable 5m
3HAWC116987	Movement sensor cable 10m
3HAWC116988	Movement sensor cable 15m
3HAWC116990	Static sensor cable 5m
3HAWC116991	Static sensor cable 10m
3HAWC116992	Static sensor cable 15m

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